



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Region 6  
1445 Ross Avenue, Suite 1200  
Dallas, Texas 75202 - 2733

RECEIVED

JUN 01 2018

SURFACE WATER  
QUALITY BUREAU

Miguel Montoya  
New Mexico Environment Department  
Surface Water Quality Bureau  
1190 South St. Francis Drive  
P.O. Box 5469  
Santa Fe, NM 87502-5469

Dear Mr. Montoya:

The Region 6 office completed its review of the Quality Assurance Project Plan (QAPP) for the "**Black Canyon Riparian Restoration Design**". The QAPP was approved on May 17, 2018 and will expire on May 18, 2020.

Please submit a revised/updated QAPP at least sixty (60) days prior to the expiration date. If no substantial technical or programmatic changes have occurred in the project, submit a letter stating that no changes are needed. This letter should also be submitted at least sixty (60) days prior to the expiration date.

Attached is the completed QAPP signature page for your records. In any future correspondence relating to this QAPP, please reference QTRAK #18-355. If you have any questions, feel free to contact me at (214) 665-2259.

Sincerely,

A handwritten signature in black ink, reading "Sharon D. Daugherty".

Sharon D. Daugherty  
Environmental Protection Specialist  
State/Tribal Program Section

Enclosure



Quality Assurance Project Plan

for the Project:

Black Canyon Riparian Restoration Design

Clean Water Act Section 319

Submitted by  
New Mexico Environment Department

*Surface Water Quality Bureau*

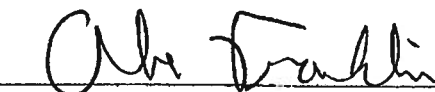
**APPROVAL PAGE**

  
John Moeny  
Project Officer, SWQB Watershed Protection Section

4/18/2018  
Date

  
Miguel Montoya  
Quality Assurance Officer, SWQB

4/20/2018  
Date

  
Abe Franklin  
Program Manager, SWQB Watershed Protection Section

4/23/2018  
Date

  
Sharon Daugherty  
Environmental Protection Specialist, WQPD, EPA Region 6

5/17/18  
Date

  
Curry Jones  
Chief, State and Tribal Programs Section, WQPD, EPA Region 6

5/17/18  
Date

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## List of Abbreviations

|         |   |
|---------|---|
| BMP     | Best Management Practice(s)                   |
| DQO     | Data Quality Objectives                       |
| EPA     | United States Environmental Protection Agency |
| NMED    | New Mexico Environment Department             |
| EMAP    | Environmental Monitoring and Assessment       |
| EPA     | Environmental Protection Agency               |
| NCD     | Natural Channel Design                        |
| QAPP    | Quality Assurance Project Plan                |
| QA      | Quality Assurance                             |
| QAO     | Quality Assurance Officer                     |
| RTK GPS | Real-time Kinematic Global Position System    |
| SOP     | Standard Operating Procedures                 |
| SWQB    | Surface Water Quality Bureau                  |
| TMDL    | Total Maximum Daily Load                      |
| WBP     | Watershed Based Plan                          |
| WPS     | Watershed Protection Section                  |

### A3. Distribution List

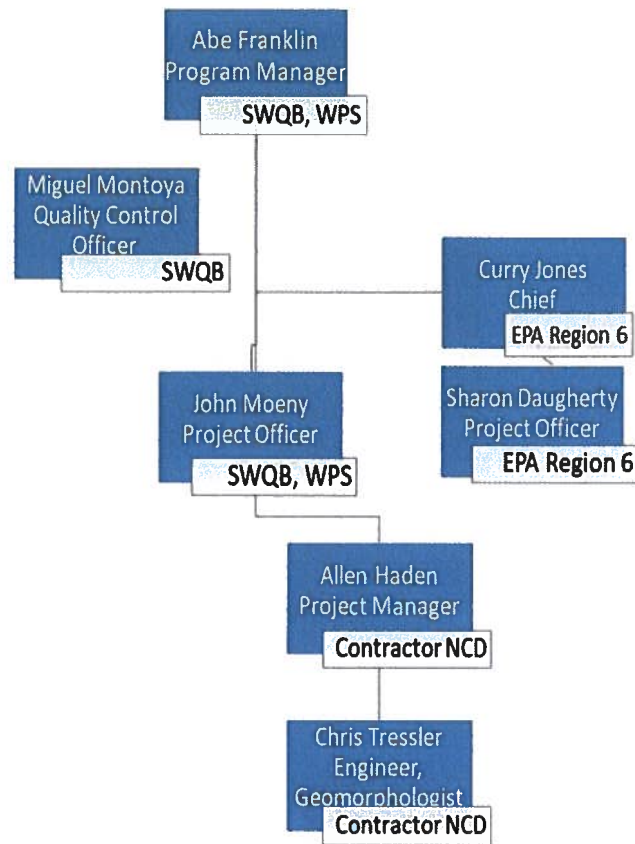
Table 1 below contains the distribution list, and project roles and responsibilities for this project. The Project Officer will ensure that copies of this approved QAPP and any subsequent revisions are distributed to the project personnel listed below. All members of the distribution list will review the QAPP and sign the Acknowledgment Statement prior to initiating any work for this project and return to Project Officer.

*Table 1. Project distribution list and contributing staff*

| Name             | Organization | Title and Role                     | Responsibility   | Contact Info   |
|------------------|--------------|------------------------------------|--|--|
| Abe Franklin     | SWQB         | WPS Program Manager                | Reviewing and approving QAPP, managing project personnel and resources                       | (505) 827-2793<br><a href="mailto:abraham.franklin@state.nm.us">abraham.franklin@state.nm.us</a>     |
| Miguel Montoya   | SWQB         | QA Officer                         | Reviewing and approving QAPP, QA audits, as needed, to assure adherence to the approved QAPP | (505) 476-3794<br><a href="mailto:miguel.montoya@state.nm.us">miguel.montoya@state.nm.us</a>         |
| John Moeny       | SWQB         | Project Officer                    | Preparing QAPP, project reporting, coordinating with contractor, and data collection         | (575) 956-1545<br><a href="mailto:john.moeny@state.nm.us">john.moeny@state.nm.us</a>                 |
| Allen Haden      | NCD          | Project Manager, Aquatic Ecologist | Project oversight, coordination, and data collection   | (928) 774-2336<br><a href="mailto:Allen@naturalchanneldesign.com">Allen@naturalchanneldesign.com</a> |
| Chris Tressler   | NCD          | Engineer, Geomorphologist          | Data Collection, Analysis and Design   | (928) 774-2336<br><a href="mailto:chris@naturalchanneldesign.com">chris@naturalchanneldesign.com</a> |
| Sharon Daugherty | EPA          | Project Officer Region 6           | Reviewing and approving QAPP   | (214) 665-2259<br><a href="mailto:daugherty.sharon@epa.gov">daugherty.sharon@epa.gov</a>             |
| Curry Jones      | EPA          | Chief, Region 6                    | Reviewing and approving QAPP   | (214) 665-6793<br><a href="mailto:jones.curry@epa.gov">jones.curry@epa.gov</a>                       |



#### A4. Project/Task Organization



#### A5. Problem Definition/Background

Black Canyon Creek (Figure 1) is a Gila Trout (*Oncorhynchus gilae*) recovery water located in southwest New Mexico that is also a *State of New Mexico CWA §303(d)/§305(b)* listed stream impaired for temperature. In 2017, the EPA approved the “Black Canyon Riparian Restoration Plan”, a watershed-based plan (WBP) that identified sources of excessive temperature loading in Black Canyon Creek contributing to the temperature impairment. Excessive temperature loading was attributed to large areas of poor canopy coverage and stream reaches that are overly wide and shallow. The WBP identifies riparian planting as a best management practice to both provide canopy coverage to the stream, while also creating opportunities to develop geomorphic complexity through lateral movement of the stream channel and inducing meanders and pools. Adding geomorphic complexity, especially pools, is vital to the long-term sustainability of Gila Trout as this stream is intermittent in places and pools act as refugia for trout during the hottest months of the year. While the WBP describes in general terms what should be done to address the temperature impairment, it is less specific on where to place water quality improvements or what, specifically, they should look like. This project will take the WBP and establish BMP types and locations.

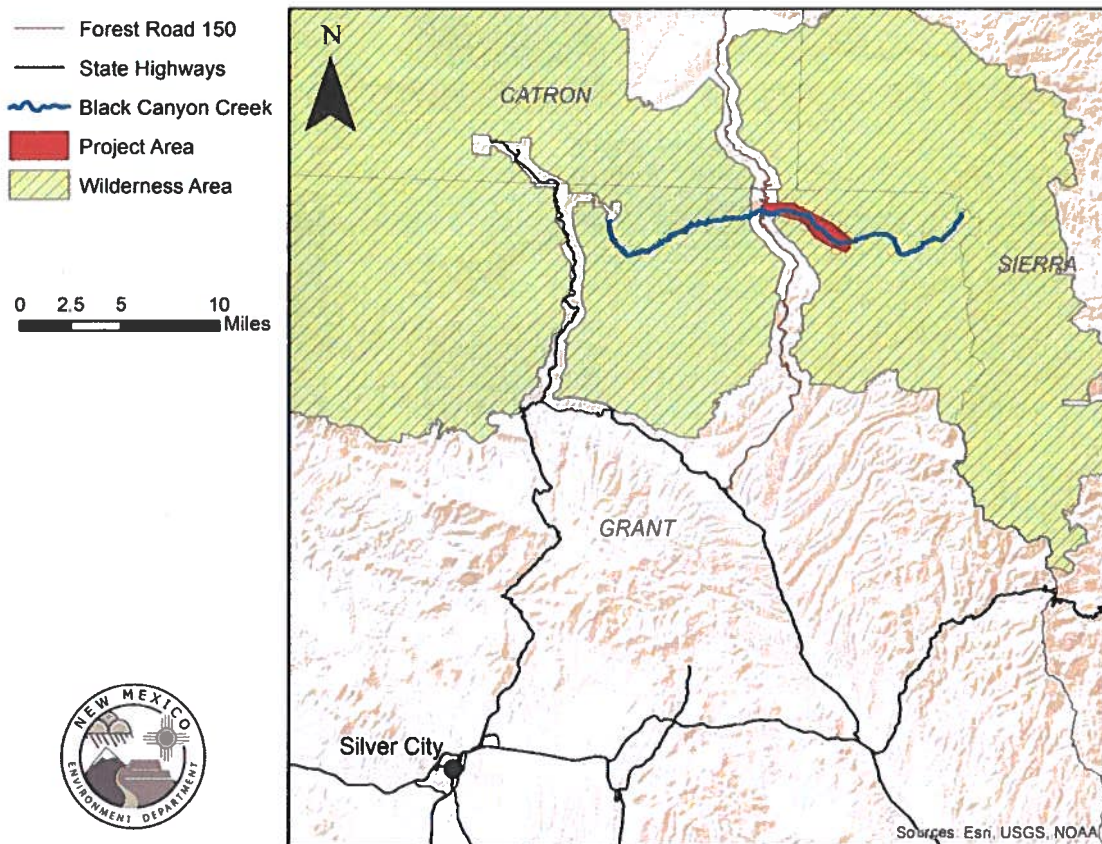


Figure 1. Black Canyon riparian restoration project area.

#### A6. Project/Task Description

The contractor, Natural Channel Design (NCD) will travel to the remote site and conduct a project area-wide assessment over the course of several days with a crew of two to three people. The project area is bounded at the downstream end by the Aldo Leopold Wilderness boundary (6902' elevation), and on the upstream end by the confluence with Aspen Canyon (7192' elevation). The assessment will include measurements of stream geomorphology equivalent to Rosgen Level II surveys (Rosgen 1996). The assessment area will include reference reaches as well as stream reaches of rapidly cooling or heating water temperatures. Reference reaches are those areas where vegetative cover is naturally very good, and where stream geometry approaches 'normal' for the valley type and watershed area. Stream geomorphology will be measured with a Trimble R8 GNSS GPS 'rover' and base station. Water temperature thermographs will be deployed over the course of several days to estimate diurnal fluctuation at up to eight sites. Vegetative canopy cover will be measured using a spherical densiometer. Collected data will be analyzed by NCD's ecologist, and geomorphologist/engineer to develop final design drawings and planting plans. Table 2 below summarizes the tasks, products, responsible party and timeline.

Table 2. Project tasks, products, timeline and responsible party

| Task                                     | Product   | Timeline   | Responsible Party      |
|--|---|--|------------------------|
| Geomorphic assessment                    | Cross sections, long profiles of reference reaches and restoration sites    | May or June 2018   | Natural channel Design |
| Water Temperature data collection        | Water temperature data from 6- 8 locations                                  | Concurrent with geomorphic assessment capturing several days of diurnal variation. | Natural Channel Design |
| Stream canopy data collection            | Percent cover of stream-side vegetation at reference and restoration sites. | Concurrent with geomorphic assessment.   | Natural Channel Design |
| Final Design Drawings and Planting Plans | Final Design Drawing and Planting Plans                                     | No later than September 2018.  | Natural Channel Design |

#### A7. Quality Objectives and Criteria for Measurement Data

##### *Data Quality Objective*

The quality of the data will be adequate to provide a high level of confidence for development of site-specific and impairment-specific restoration measures which include riparian planting and the installation of small hand-built in-stream structures to improve sinuosity, and geomorphic complexity.

##### *Measurement Quality Objectives*

The measurement quality objectives will be sufficient to achieve the Data Quality Objectives (DQO) and will be in conformance with those listed in the SWQB QAPP. Water temperature measurements will reflect the accuracy and precision of the instrument, an Onset Hobo Pro V2 datalogger, stream geomorphology (cross sections and long-profiles) will reflect the manufactures specifications for accuracy of the survey equipment (Trimble R8 GNSS) and the canopy coverage will reflect the precision and accuracy of the person measuring the canopy. Korhonen, et al. 2006, have demonstrated that canopy coverage estimates using a spherical densiometer range from 0- 10% deviation from the true value. Table 3 below provides the anticipated numerical measurement quality expectations for this project.

Table 3. Numerical measurement quality expectations

| Parameter                   | Accuracy*        | Precision <sup>+</sup> |
|-----------------------------|------------------|------------------------|
| <b>Water temperature</b>    | +/- 0.21 deg C   | +/- 0.1 deg C          |
| <b>Stream geomorphology</b> | 3.0mm horizontal | +/- 1 ppm horizontal   |
|                             | 3.5mm vertical   | +/- 0.4 ppm vertical   |
| <b>Stream Canopy</b>        | +/- 10%          | +/- 5%                 |

\*Defined as the deviation from true value

+Defined as the closeness of two or more measurements to each other

#ppm = millimeters per thousand meters

Because this is a targeted assessment of a relatively small piece of the Black Canyon Creek assessment unit, the representativeness of the data is limited to the project area. No attempts are being made to infer stream condition outside the project area with these data. Similarly, the completeness of the data is limited to the project area, and only those data types which are useful in the development of BMPs to address the temperature impairment in Black Canyon.

#### A8. Special Training Needs/Certification

No special training or certification will be required of the contractor, Natural Channel Design. Their staff includes licensed engineers in addition to ecologists and geomorphologists with graduate level training and decades of natural resource data collection experience. Their qualifications and experience lend confidence to the estimated accuracy and precision of the data being collected. The SWQB Project Officer will provide oversight to ensure that data collection is consistent with the current SWQB QAPP, and referenced SOPs.

#### A9. Documents and Records

The SWQB Project Officer will make copies of this QAPP and any subsequent revisions available to all individuals on the distribution list.

Project documents include this QAPP, field notebooks, validation and verification records, geomorphic data, stream canopy data, stream temperature files and QC records. Also included are project reports. The contractor, NCD, will keep all data for their own use in developing BMPs, but copies of project data will also be kept by the project officer. Details are included in section B.10 below.

## Group B: Data Generation and Acquisition

#### B1. Sampling Process Design (Experimental Design)

During the development of the watershed based plan, several areas were identified where stream temperatures were either rapidly cooling or heating in response to stream channel morphology, valley slope and width and canopy coverage. This project will seek to better understand how those variables interact to drive water temperature and to what extent they can be managed to improve water quality (reduce the temperature).



The conceptual sampling design is that areas with good canopy coverage, cool water temperatures and a channel morphology that is stable for the stream type serve as a desired or reference condition. Areas with poor canopy coverage, warm water temperatures, and stream morphology that deviates from typical for the stream type are candidates for BMP installation to bring them up to desired condition. The sampling design will seek to sample each type of area at multiple locations to adequately capture the normal variability and build confidence in the reference vs. degraded condition dichotomy.

## B2. Sampling Methods

Three types of data will be collected: 1) Stream geomorphology, 2) Water temperature, and 3) Vegetative Canopy. Geomorphology data will be taken throughout the project area at both reference reaches and those reaches which depart from reference condition. Cross sections and longitudinal profiles of the stream will be measured using Trimble R8 GNSS GPS 'rover' and base station and will result in an assessment equivalent to a Rosgen Level II, (Rosgen, 1996) per methods identified in Stream Channel Reference Sites field techniques (Harrelson, 1994). Temperature data will be collected using Hobo V2 dataloggers to document both the diurnal variation along the project reach as well as longitudinal trends for heating and cooling. Loggers will record data every 15 minutes and deployed using the SWQB Thermograph SOP ([SWQB SOP 6.3](#)) section 6.2. Vegetative canopy will be measured using a spherical densiometer according to the Bureau's Physical Habitat SOP ([SWQB SOP 5.0](#)) section 6.3.3 pertaining to canopy cover.

Locations for stream morphology measurements will be chosen that represent areas of reference reaches and degraded reaches with measurements taken throughout the project reach. A typical assessment at each reference or restoration site will include a single long-profile and multiple cross sections. Temperature data loggers will be deployed in areas known to currently exceed the High Quality Cold Water Aquatic Life Standard, areas known to be consistently cooler than the HQCWAL standard and in areas within a gradient of vegetative canopy coverage from low to high. A total of 8 temperature logger deployments is anticipated. Canopy coverage using spherical densiometers will be taken at all stream geomorphology stations and at all temperature data logger stations.

Data will be collected during May and June 2018 to document the period when stream temperature typically warm to the point of exceeding the High Quality Cold Water Aquatic life temperature standard and riparian vegetation is fully developed.

## B3. Sample Handling and Custody

Because there are no plans to collect samples for laboratory analysis, there are no handling requirements.

## B4. Analytical Methods

Because there are no plans to collect samples, no analytical methods are needed.

## B5. Quality Control

For this project, the QC activities are those needed to assess and demonstrate the reliability of the data. The SWQB controls the quality of the data by using standardized methods that are documented in the most current NMED/SWQB SOPs. All personnel who collect environmental data will be familiar with these protocols and collect data in accordance with the procedures as they are defined in the SOPs.

Stream morphology data will be collected using high resolution Trimble R8 GNSS GPS 'rover' and base station instrumentation that removes user error and bias in comparison to reading and recording measurements using conventional laser- level type survey equipment.

Temperature quality control will be assured by verifying deployment locations are well submerged and not subject to erroneous air temperature readings. Loggers will also be checked for accuracy prior to, and following deployment in the field as described in the Bureau SOP ([SWQB SOP 6.3](#)).

Canopy coverage has the greatest potential for observer error and bias. Quality control will be strengthened by following the Bureau's Physical Habitat SOP 5.0. Specifically portions within section 6.3.3 pertaining to percent canopy cover and having the same observer take measurements at each location. This reduced the bias affect and increases the precision of each measurement.

#### B6. Instrument/Equipment Testing, Inspection, and Maintenance

The instruments that may require testing, inspection and maintenance are the water temperature data loggers, Trimble R8 GNSS GPS 'rover' and base station, and spherical densiometer. Temperature data loggers will be tested as described in the Bureau's SOP ([SWQB SOP 6.3](#)) section 6.4. Trimble R8 GNSS GPS 'rover' and base station will be tested against a known elevation from a nearby US Geodetic Survey marker near the bridge over Black Canyon and approximately 1 mile from the project area. Spherical densiometer will be visually inspected to ensure all components (mirror and bubble level) are in working order.

#### B7. Instrument/Equipment Calibration and Frequency

The instruments involved in this project include-- water temperature data loggers, spherical densimeters and a Trimble R8 GNSS GPS 'rover' and base station. Temperature dataloggers will be tested for accuracy, before and after deployment as described in Thermograph Calibration Verification section of SWQB SOP 6.3. Loggers found to be out of manufacturer accuracy specification (+/- 0.21 deg C) will not be deployed. The Trimble R8 GNSS base station will be calibrated against the nearest US Geodetic Survey marker with the base station set to the same reference elevation as the survey marker. The densiometer does not require calibration other than inspection by field personnel prior to each use. Calibration records will be kept from Natural Channel Design and copies given to the Project Officer who will maintain them in the project file.

#### B8. Inspection/Acceptance of Supplies and Consumables

There are no supplies or consumables that could affect the quality of data related to this project.

#### B9. Non-direct Measurements

For this project, non-direct measurements are not considered to be integral to fulfilling the stated objectives. However, some non-direct measurements have prove useful in post-data collection analysis and putting the data into context within the whole watershed. The primary source of non-direct measurements will come from the use of existing aerial and satellite photos of Black Canyon Creek to determine historic channel locations and riparian conditions. The most common and anticipated source is the National Agriculture Imagery Program (NAIP) imagery from the US Department of Agriculture for New Mexico. The specifications for this imagery are documented on the internet at the following location:

#### B10. Data Management

Water temperature data files generated by this project will be sent to the Project Officer. Data points contained with the logger's native file format cannot be altered and therefore not subject to accidental or intentional manipulation. Raw GPS will be housed electronically by the Project Officer. Original hard-copy data sheets for riparian canopy coverage will be kept by the Project Officer, but will be scanned and electronic copies kept in the project file, along with all other electronic data, by the Project Officer at the Silver City field office. The electronic project file will be uploaded to the SWQB server. A second, duplicate project file will be maintained by the Project Officer on hard-drive in the Silver City field office.

### Group C: ASSESSMENT AND OVERSIGHT

#### C1. Assessments and Response Actions

The SWQB Project Officer will provide project oversight by periodically assisting with and/or reviewing data collection efforts. The SWQB Project Officer will assess project progress to ensure the QAPP is being implemented, including periodic audits by the QAO, as needed. Any problems encountered during the course of this project will be immediately reported to the SWQB Project Officer who will consult with appropriate individuals to determine appropriate action. Should the corrective action impact the project or data quality, the SWQB Project Officer will alert the Quality Assurance Officer. If it is discovered that monitoring methodologies must deviate from the approved QAPP, a revised QAPP must be approved before work can be continued. All problems and adjustments to the project plan will be documented in the project file and included in the final report.

#### C2. Reports to Management

An initial report after field work has been completed will be filed by the contractor with the SWQB Project Officer no later than 3 weeks following completion of the field data collection. This will include days spent, data collection locations, raw data files, and any factors which may have affected data quality (personnel substitutions, equipment malfunctions, inclement weather, etc.). A final report which includes, raw data, data analysis and BMP recommendations and designs will be produced prior to the contract expiration.

The SWQB Project Officer will be responsible for maintaining project progress in the EPA Grants Reporting and Tracking System and the final report, and all other required project deliverables required to be submitted to the EPA under this contract.

## GROUPS D: DATA VALIDATION AND USABILITY

### D1. Data Review, Verification, and Validation

Data will be reviewed by the contractor prior to demobilization from the field site. Data will be considered usable if the requirements of this QAPP were followed and the data is within acceptable range limits as defined under this QAPP. Data that appears incomplete, questionable, or outside the bounds of expected values for the parameter will be flagged for review. Flagged data will be discussed with the SWQB Project Officer to determine the potential cause and usability. If a reasonable justification for use of the data cannot be attained, those data will be not used in analysis and restoration design unless the data can be recollected and assessed for usability.

The Project Officer will review the final design drawings and planting plans to ensure the goals of the project were met.

### D2. Verification and Validation Methods

The Project Manager will ensure that valid and representative data are acquired. Verification of and validation of field sampling and analytical results will occur in the review of data, performed by the Project Manager in accordance with the SWQB SOP for Data Verification and Validation ([SWQB SOP 15.0](#)) section 6.2 Physical/Habitat Data Verification and Validation. Results of the verification process will be included in the final reports.

Verification issues include the completeness of the record, and verification of calibration. Validation issues include the review of the data for anomalous data points and removal of data points based on reasonable explanation. Verification will be completed by staff members who were not responsible for the data collection.

### D3. Reconciliation with User Requirements

The user requirement is a restatement of the data quality objective: The quality of the data will be adequate to provide a high level of confidence of determining feasible restoration projects in the Black Canyon Watershed.

If project results do not meet this requirement, then additional monitoring may be necessary to fill in data gaps or it may be necessary to extend the monitoring period to measure effects that were not apparent during the project period.



## REFERENCES

Harrelson, Cheryl C; Rawlins, C. L.; Potyondy, John P. 1994. Stream channel reference sites: an illustrated guide to field technique. Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.  
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Rosgen, Dave. 1996. *Applied River Morphology*. Wildland Hydrology. Pagosa Springs, Colorado.

SWQB SOP 5.0 Physical Habitat. Effective April 15, 2016.  
[https://www.env.nm.gov/swqb/SOP/documents/5.0\\_Physical\\_Habitat\\_SOP\\_4-11-2016.pdf](https://www.env.nm.gov/swqb/SOP/documents/5.0_Physical_Habitat_SOP_4-11-2016.pdf)

SWQB SOP 6.3 Thermographs. Effective March 03, 2013.  
[https://www.env.nm.gov/swqb/SOP/documents/6.3\\_SOP\\_Thermograph\\_4-11-2016.pdf](https://www.env.nm.gov/swqb/SOP/documents/6.3_SOP_Thermograph_4-11-2016.pdf)

SWQB SOP 15.0 Data Verification and Validation. Effective March 15, 2016.  
[https://www.env.nm.gov/swqb/SOP/documents/15VVSOP03\\_15\\_2016.pdf](https://www.env.nm.gov/swqb/SOP/documents/15VVSOP03_15_2016.pdf)

## Appendix 1. QAPP Acknowledgement Form



New Mexico Environment Department Surface Water Quality Bureau

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### Riparian Restoration Design for Black Canyon Creek

#### Quality Assurance Project Plan Acknowledgement Statement

This is to acknowledge that I have received a copy of Black Canyon Riparian Restoration Design Quality Assurance Project Plan.

As indicated by my signature below, I understand and acknowledge that it is my responsibility to **read, understand, become familiar with and comply** with the information provided in the document to the best of my ability.

---

Signature

---

Name (Please Print)

---

Date